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Classical mechanics is a chief example of the scientific method organizing a "complex" collection of information into theoretically rigorous, unifying principles; in this sense, mechanics represents one of the highest forms of mathematical modeling. This textbook covers standard topics of a mechanics course, namely, the mechanics of rigid bodies, Lagrangian and Hamiltonian formalism, stability and small oscillations, an introduction to celestial mechanics, and Hamilton-Jacobi theory, but at the same time features unique examples_such as the spinning top including friction and gyroscopic compass_seldom appearing in this context. In addition, variational principles like Lagrangian and Hamiltonian dynamics are treated in great detail.

Using a pedagogical approach, the author covers many topics that are gradually developed and motivated by classical examples. Through 'Problems and Complements' sections at the end of each chapter, the work presents various questions in an extended presentation that is extremely useful for an interdisciplinary audience trying to master the subject. Beautiful illustrations, unique examples, and useful remarks are key features throughout the text.

Classical Mechanics: Theory and Mathematical Modeling may serve as a textbook for advanced graduate students in mathematics, physics, engineering, and the natural sciences, as well as an excellent reference or self-study guide for applied mathematicians and mathematical physicists. Prerequisites include a working knowledge of linear algebra, multivariate calculus, the basic theory of ordinary differential equations, and elementary physics.